Volunteer Lake Assessment Program Individual Lake Reports

PARTRIDGE LAKE, LITTLETON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	896	**Max. Depth (m):**	15.8	**Flushing Rate (yr^{-1}):**	0.6
Surface Area (Ac.):	104	**Mean Depth (m):**	5.8	**P Retention Coef:**	0.71
Shore Length (m):	4,500	**Volume (m^3):**	2,434,000	**Elevation (ft):**	846

TROPHIC CLASSIFICATION

Year	Trophic class
1992	MESOTROPHIC
2006	MESOTROPHIC

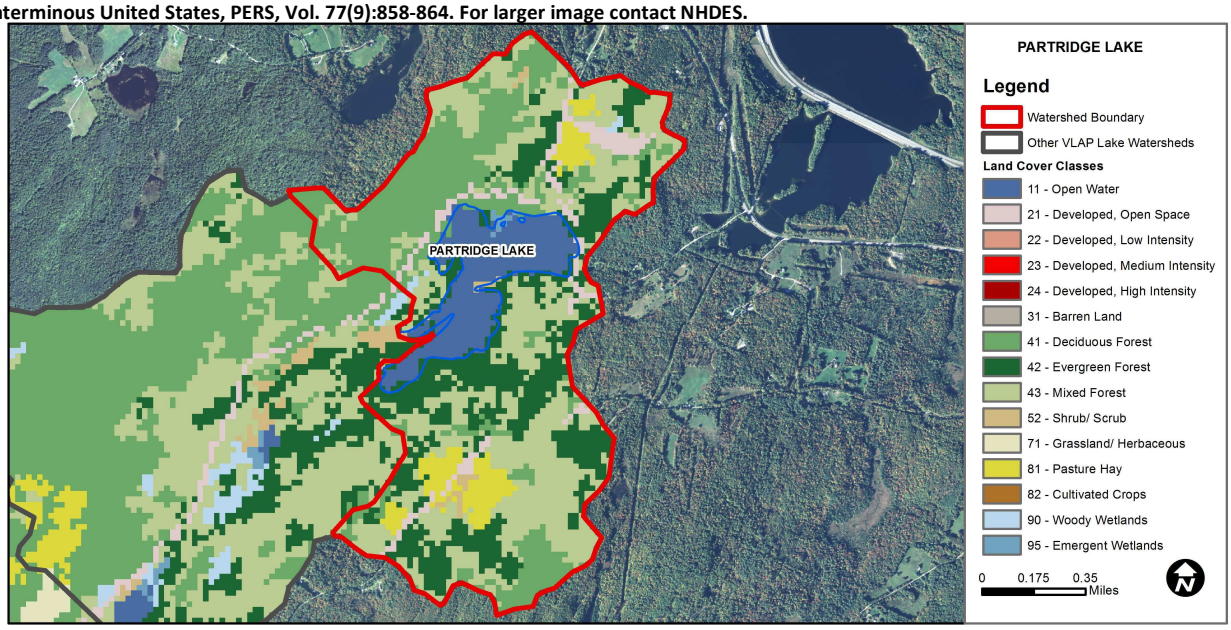
KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator and the chlorophyll a indicator is okay.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Dissolved oxygen satura	Slightly Bad	There are >10% of samples (minimum of 2), exceeding criteria.
	Chlorophyll-a	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator.
Primary Contact Recreation	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Good	There are at least 10 samples with one, but < 10% of samples, exceeding indicator.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	10.3	Barren Land	0	Grassland/Herbaceous	0
Developed-Open Space	4.41	Deciduous Forest	21.65	Pasture Hay	5.02
Developed-Low Intensity	0	Evergreen Forest	23.15	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	33.72	Woody Wetlands	0.25
Developed-High Intensity	0	Shrub-Scrub	0.71	Emergent Wetlands	0.25

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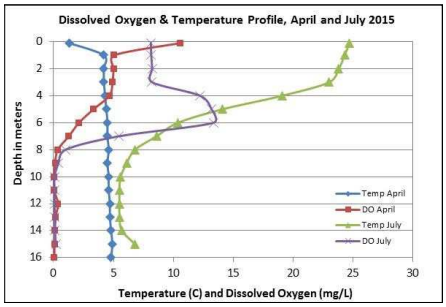
Partridge Pond, Littleton

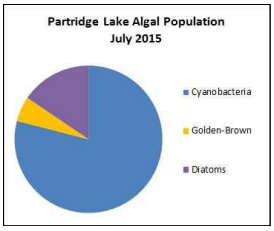
2015 Data Summary

Recommended Actions: A dissolved oxygen profile was conducted during winter ice cover in April and indicates that dissolved oxygen levels are depleted from the lake bottom to 8 meters during the winter months and results in additional winter phosphorus loading which contributes to the spring algal blooms. The algae die-off and sink to the lake bottom adding to the organic layer which results in further oxygen depletion during the summer. A positive sign for the lake in the significantly decreasing (improving) epilimnetic phosphorus levels indicating watershed management efforts have been successful at reducing phosphorus loads from the watershed. Inlet 1 phosphorus levels were slightly elevated following significant storm events. Agricultural activities upstream may influence phosphorus levels as well as wetlands. Work with agricultural property owners on ways to reduce nutrient loads to the tributary system. Keep up the great work!

Observations (*Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **Chlorophyll-a:** Chlorophyll levels were elevated in June and then decreased to low levels in August. The 2015 average chlorophyll level decreased from 2014 but was greater than the state median. Historical trend analysis indicates highly variable chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Deep spot and tributary conductivity levels remained slightly elevated and greater than the state median yet were within average ranges for those stations and not above a level of concern. Historical trend analysis indicates stable epilimnetic conductivity levels since monitoring began.
- **E. coli:** Inlet 1 E. coli levels were low in June and increased to higher levels in August yet remained much less than the state standard of 406 cts/100 mL for surface waters.
- **Total Phosphorus:** Epilimnetic phosphorus levels were higher in June and decreased as the summer progressed and remained within a low range and less than the state median. Historical trend analysis indicates significantly decreasing (improving) epilimnetic phosphorus since monitoring began. Metalimnetic (middle water layer) phosphorus levels were moderate and stable from June to August. Hypolimnetic (lower water layer) phosphorus levels were elevated in June, decreased slightly in July, and increased in August. Hypolimnetic phosphorus remained at greatly elevated levels throughout the summer due to internal phosphorus loading from bottom sediments when dissolved oxygen levels are depleted in hypolimnetic waters. Inlet 1 phosphorus levels were slightly elevated on each sampling event following significant storm events. Inlet 10, Inlet 6 and Outlet phosphorus levels were within a low to average range for those stations.
- **Transparency:** Transparency was good and remained fairly stable from June to August despite the elevated June algal growth and significant storm events prior to sampling, which is great news. Average transparency remained stable with 2014 and was higher (better) than the state median. Historical trend analysis indicates relatively stable transparency with moderate variability between years. Transparency measured with the viewscope (VS) was much better than that measured without (NVS) in July and likely a better representation of actual conditions.
- **Turbidity:** Epilimnetic turbidity was slightly higher in June probably due to algal growth but remained within a low level and decreased through August. Metalimnetic turbidity was slightly elevated on each sampling event likely due to layers of algae. Hypolimnetic turbidity was also elevated on each sampling event due to the formation and accumulation of organic compounds due to depleted dissolved oxygen levels. Inlet 1 turbidities were elevated in July and August and Inlet 10 turbidity was slightly elevated in July. Significant storm events and wetland flushing likely contributed to the turbidity. Inlet 6 and Outlet turbidities were low.
- **pH:** A laboratory instrument error resulted in invalid epilimnetic pH values; we apologize for this error. Metalimnetic, hypolimnetic and tributary pH levels were all within the desirable range 6.5-8.0 units. Historical trend analysis through 2014 indicates relatively stable epilimnetic pH with moderate variability between years.





NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

Station Name	Table 1. 2015 Average Water Quality Data for PARTRIDGE LAKE								
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	25.5	6.44	68.6		7	4.68	5.30	0.79	
Metalimnion			75.5		14			1.87	6.77
Hypolimnion			99.3		91			8.15	6.54
Inlet 1			85.6	90	23			2.25	7.20
Inlet 10			90.6		9			1.07	7.29
Inlet 6			98.5		14			0.64	7.42
Outlet			67.6		8			1.13	7.25

Historical Water Quality Trend Analysis

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data show low variability.	Chlorophyll-a	Stable	Trend not significant; data highly variable.
pH (epilimnion)	Stable	Trend not significant; data moderately variable.	Transparency	Stable	Trend not significant; data moderately variable.
			Phosphorus (epilimnion)	Improving	Data significantly decreasing.